AGROECOLOGY TOOLS AND EQUIPMENT FACT SHEET

AUGUST 12, **2025**

AGROECOLOGY STUDY

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Investing in rural people

TOOLS AND EQUIPMENT FOR AGROECOLOGY PRACTICES
MANUAL TOOLS TO FACILITATE MINIMUM TILLAGE

Animal-driven ripper/ Animal traction riper

Figure 1: Animal traction ripper

Description

The ox-driven ripper shown in Figure 1 above is a simple ripper attachment to the plough beam, which can be easily mounted after removing the shear blade of the animal traction plough. The operator creates about 10 cm deep rip-lines with the tool, which is pulled by a pair of oxen. The width can be adjusted with the type of wings attached. These rippers are locally fabricated in Kenya and found in limited workshops. The prices range from **Ksh. 10,000- Ksh. 15,000**.

Strength: Other ox-driven rippers can be adjusted to work down to 25 cm soil depth and can remove hardpans formed by previous cultivation and create a rip line at the same time.

Weakness: Requires a lot of human physical strength to control and direct thus might be cumbersome to use for smallholder farmers who are women.

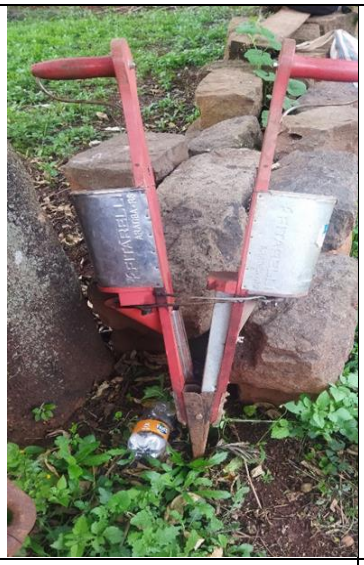
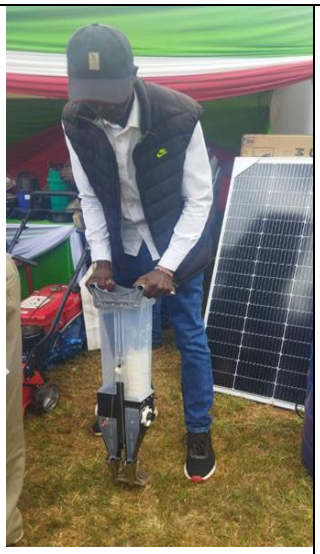
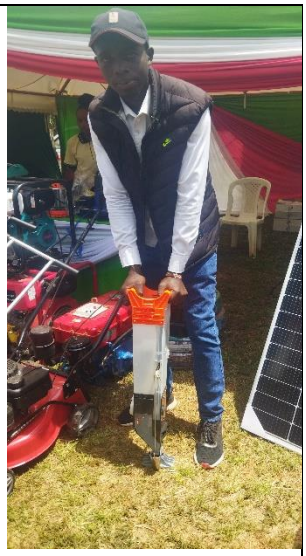
Analysis: Animal-driven rippers, locally fabricated in Kenya, are accessible in rural areas where livestock power is common, especially in arid and semi-arid regions. This tool is widely used in counties like Meru, where smallholders rely on animal power for minimum tillage. The tool's heavy labor requirements can pose challenges for women, who constitute a large portion of Kenya's farming workforce. Community-based training could help improve usability and comfort.

Recommendation: Fabricators can be advised to develop modified ripper designs with ergonomic handles or lighter materials to ease physical strain.

MANUAL TOOLS/EQUIPMENT FOR PLANTING

Soil tillage leads to the breakdown of soil structure and land degradation and is therefore not sustainable. However, to be able to practice agroecology by planting into unploughed soil, special tools/equipment are necessary. Both manual and mechanical systems are available to small-holder farmers for sowing crops under conservation agriculture. The tools are listed below:

I. Jab Planter

			
Figure 2: Seeding with a jab planter without tilling the land	*Figure 3: Jab planter (wooden) owned by one of the AEC in Laikipia County*	*Figure 4: Jab Planter with seed and fertilizer compartment fabricated by Fine Touch Africa (@Ksh. 9,000)*	*Figure 5: Jab planter with seed compartment only (@Ksh. 7,500)*

Description

Jab Planters were originally developed by Brazilian manufacturers. There have been various attempts to fabricate them locally in African countries such as Zimbabwe and Mozambique. The jab planter has two compartments, one for fertilizer and one for seed, and both are mounted on a wooden frame with two tips as shown in Figure 3. Once the tips are pushed into the soil and opened by the operator, one seed and fertilizers drop into the planting hole. The Jab Planter ranges from **Ksh.7,500-Ksh.9,500**. This tool can be found at BrazAfric Enterprises Ltd in Nairobi as well as FineTouch Africa Eloret. Majority of the farmers across the three counties mentioned the need for this jab planter.

Strength: Seeding with the animal traction seeder is fast and efficient. The jab planter can seed very effectively into a mulch-covered farm even with no-tilled soil. Allows the planting of several kinds of crops, such as maize, beans, and sorghum among others. It has a planting capacity of 2 hectares per day. The jab planter is quicker than hoe or pointed stick methods once the technique is mastered, and seed and fertilizer can be placed with more precision.

Weakness: The planter gets clogging of the tips if the soil is too sticky. Experience is needed to be able to seed well and accurately, and in wet clay soils, seeding can be difficult. Jab planters are also more expensive than hoes or pointed sticks, and are still difficult to purchase.

Analysis: Ideal for precise, small-scale planting; requires some experience for optimal use.

Recommendation: Partner with local artisans to produce jab planters more affordably and organize demonstration sessions in farming communities to train users on effective handling and clog prevention.

II. Animal traction direct planters

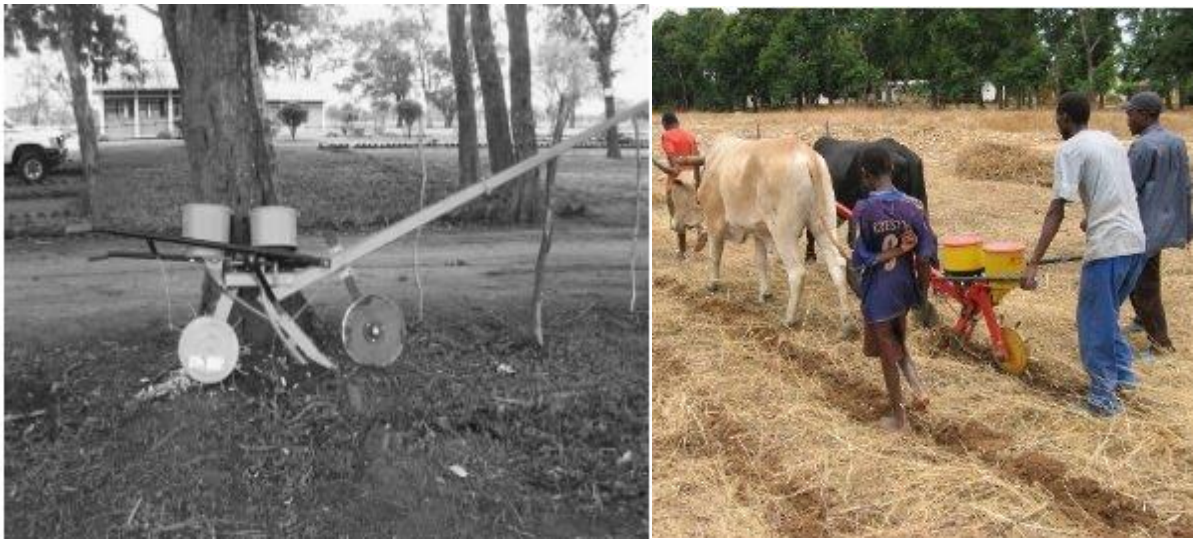


Figure 6: Animal traction direct planter cutting through mulch

Description

The direct planter has a coulter, which cuts into mulch, a ripper that opens a small rip-line, a seed and fertilizer hopper and finally a drive wheel that activates seed and fertilizer release and covers the seed at the same time as shown in the Figure 6 above. These planters are locally fabricated in Kenya and found in *Jua Kali* workshops. The prices range from **Ksh. 20,000- Ksh. 30,000**.

Strength: The planters have seed plates for maize, sorghum, beans, sunflower and cowpeas. This seeding practice favors better conservation of the soil properties due to minimum disturbance and the preservation of residues that incorporate organic matter and improve the soil structure. The use of animal power enables small-scale farmers to adopt this practice without investing in high-cost machinery and using locally available livestock as animal power or buying affordable equipment. The improvement of soil properties achieved with lower disturbance and residue preservation, directly improves the crop yield under normal conditions and makes the crop system more resilient in the event of natural disasters such as droughts or heavy rainfall.

Weakness: Inefficient cutting if the disk is clogged leads to an accumulation of residues between the different parts of the seeder and results in seed and fertilizer placement problems, i.e., irregular spacing or complete absence of seeds. Implements are relatively expensive and not readily available. Residues have to be dry to enable the coulter to cut through the mulch. Seeding depth has to be carefully calibrated. Animals need to be trained.

Analysis: The tool is priced higher than jab planters, it helps conserve soil properties, reducing the need for costly soil amendments.

Recommendation: Collaborate with local workshops to customize planters for specific soil types and train farmers on calibration to prevent clogging and ensure even planting depth.

III. Manual hand-driven seed planter

Figure 7: Metallic manual hand-driven seed planter

Figure 8: Picture showing the seed compartment of the metallic manual hand-driven seed planter

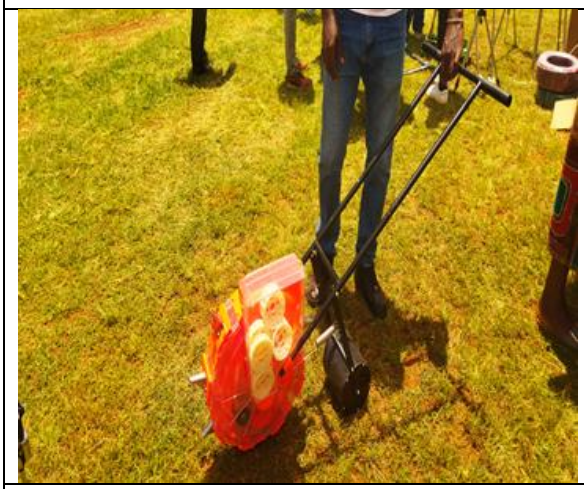


Figure 9: Manual hand-driven seed planter fabricated by FineTouch Africa (@ Ksh. 17,000)

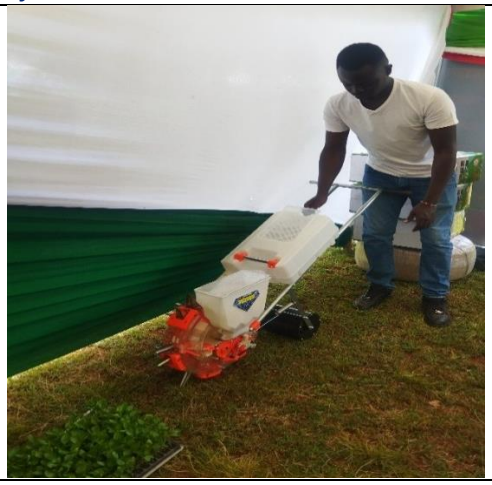


Figure 10: Manual hand-driven seed planter with fertilizer compartment fabricated by FineTouch Africa (@ Ksh. 24,000)

Description: This tool is a lightweight, metallic, manually operated seed planter designed for small-scale farming operations. It enables precise seed placement, reducing the need for labor-intensive hand planting. Some versions, such as those fabricated by FineTouch Africa, come with an added fertilizer compartment, allowing farmers to apply both seed and fertilizer in one pass, which can be advantageous for efficiency. The tool's design includes a seed compartment (Figure 8) for holding a substantial volume of seeds, and it can be adjusted for different seed types and spacing. Models range in price, with the standard model priced at approximately **Ksh. 17,000**, while the version with a fertilizer compartment is priced at around **Ksh. 24,000**.

Strengths: By mechanizing the planting process, the seed planter reduces the manual effort and time required for seeding, allowing farmers to cover more area in less time. The tool ensures consistent seed depth and spacing, which can improve crop uniformity and yield potential. The model with a fertilizer compartment allows for simultaneous seeding and fertilizing, improving nutrient management efficiency. Compared to larger, motorized planting equipment, this tool offers an affordable option for smallholders seeking some level of mechanization. Constructed from metal, the planter is durable and likely to withstand frequent use and various soil conditions.

Weaknesses: Though it reduces labor compared to hand planting, this tool still requires significant manual effort and may be challenging for some farmers to operate for extended periods. The planter may struggle in hard or compacted soils where manual operation becomes more difficult. Although it is more affordable than mechanized options, the cost may still be prohibitive for some smallholder farmers, especially those with very limited capital. The metallic parts can be susceptible to rust if not properly maintained, particularly in regions with high humidity.

Recommendation: This seed planter is a valuable tool for smallholder farmers looking to enhance planting efficiency and precision. For those with limited labor resources or who manage multiple acres, this tool can streamline planting and reduce time requirements. It is especially recommended for farmers with loose to moderately compact soils, where manual operation is more feasible. Farmers considering this tool should also explore group purchasing or cooperative ownership models to reduce the initial investment cost. Additionally, basic maintenance practices, such as cleaning and applying rust-resistant coatings, are recommended to extend the tool's lifespan.

SIMPLE MOTORIZED TOOLS FOR PLANTING

Two-wheel walking tractor (planter)

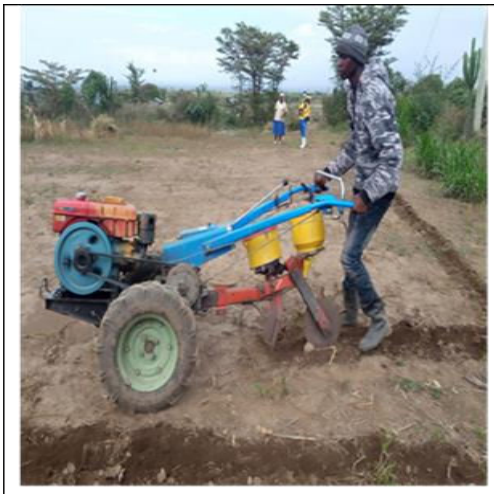
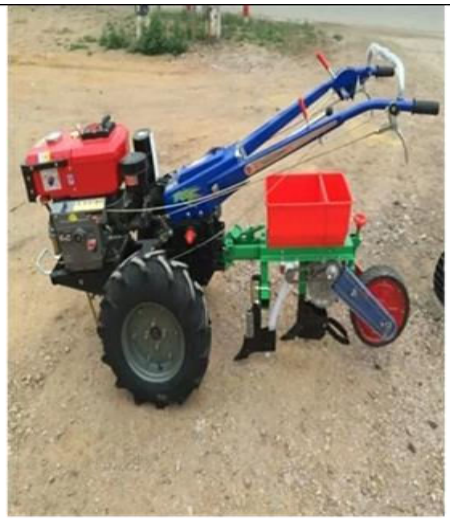
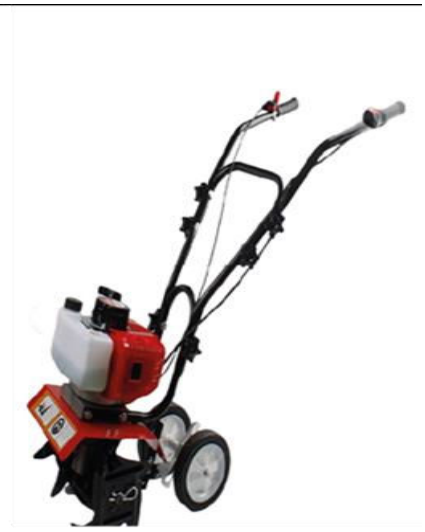
		

Figure 11: Two-wheel tractor no-till seed drill	*Two-wheel tractor with maize planter going for Ksh. 180,000 from Forward Agricultural Machinery Kenya Ltd.*	*Petrol-driven tiller*

Description

Two-wheel tractors have been used by small farmers in many parts of the world for over 30 years, and they are essentially the first mechanical progression from animal traction systems. There are various types of two-wheel tractors e.g.; the CA seed drill shown in Figure…. below consists of a cutting coulter, followed by a tine opener, with a steel drive wheel/press wheel behind. It features a horizontal flat plate metered seed box and a fertilizer box. The rubber-tired wheel on the side is for stability and depth control. Price ranges from **Ksh. 150,000- 250,000**.

Strengths: Two-wheel tractor planters are generally more affordable than larger, four-wheel tractor options, making them accessible to smallholder farmers. These planters can be used for multiple purposes, including planting a variety of crops, and in different terrains, such as small fields or hilly areas. The use of a two-wheel tractor planter reduces manual labor during the planting process, allowing farmers to cover more land in less time. Two-wheel tractors typically consume less fuel than larger tractors, helping reduce operational costs. They are relatively simple to operate and maintain, requiring minimal technical knowledge, which makes them suitable for use in rural or developing areas. Compared to heavier machinery, two-wheel tractors cause less soil compaction, preserving soil structure and promoting better crop growth. Their compact size allows for easy maneuverability in small plots, making them ideal for use on smallholder farms with limited space.

Weakness: Two-wheel tractors have lower horsepower compared to larger tractors, which limits their ability to handle heavy tasks or work on larger farms efficiently. The area they can cover in a day is smaller compared to four-wheel tractors, which could be a disadvantage for larger-scale operations. Two-wheel tractor planters require more physical effort to operate, particularly in uneven or sloping fields, which could cause fatigue. There may be fewer attachments or accessories available for two-wheel tractors compared to larger ones, which limits their adaptability to diverse farming tasks. These planters are not ideal for large-scale farming, as their efficiency decreases with increased field size. The quality of planting with a two-wheel tractor planter can be affected by the operator's skill and experience, especially in terms of row spacing and depth control. In rough terrain or on uneven ground, two-wheel tractors may be less stable, leading to reduced precision in planting operations.

Analysis: Two-wheel tractors are ideal for small farms in hilly areas such as Meru County, where traditional tractors are unsuitable. These tractors allow farmers to cover more ground with less labor, crucial for the aging farming population. The higher price limits accessibility, and most smallholders would benefit from cooperative ownership or rental programs.

Recommendation: CGA can encourage community sharing models or cooperative purchases, possibly supported by microfinance institutions, to make two-wheel tractors more attainable for smallholder farmers.

TOOLS/EQUIPMENT FOR CHOPPING BIOMASS

Chaff cutter

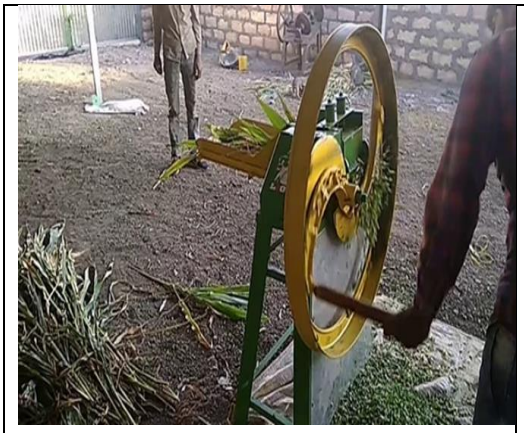


Figure 12: Manual hand-driven chaff cutter

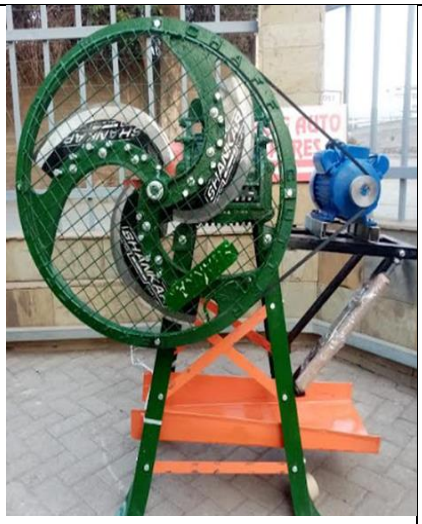


Figure 13: Motor-driven chaff cutter

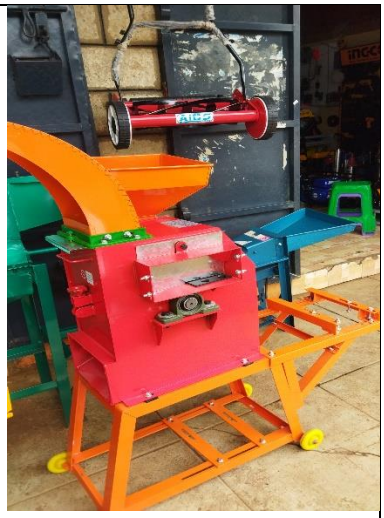


Figure 14: Two in one chaff cutter for dry and wet matter seen at Farady Machinery, Meru

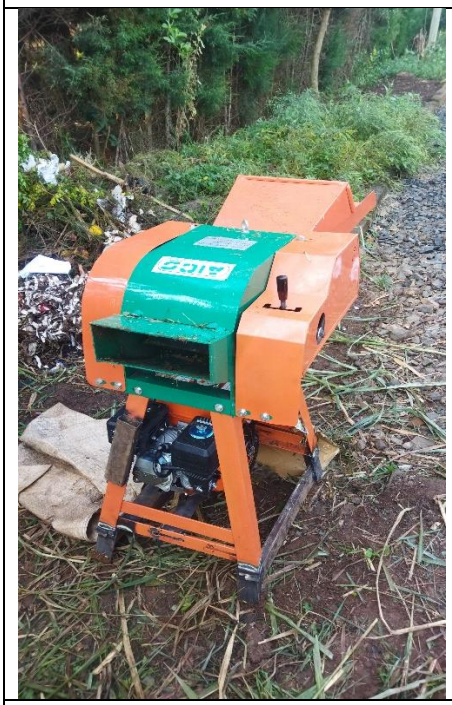


Figure 15: Motor-driven chaff cutter seen at Eldo Fabricators

Description

Chaff cutters exist in 2 forms; hand-driven and motor-driven chaff cutters. These machines are easily available in farm machinery/equipment stores countrywide. The consultant was able to site this

equipment across all three target counties. The prices range from; **Ksh. 35,000-Ksh.60,000** depending on the number of blades and the horsepower.

Strength: Chaff cutters make the process of cutting biomass quicker and more efficient compared to manual methods, saving time and labour. Cutting biomass into smaller pieces makes it easier for decomposition and thus faster organic input production. Chaff cutters can process various types of biomasses. Modern chaff cutters are designed with safety features that reduce the risk of injury, compared to using manual cutting tools like machetes. Large volumes of biomass can be processed in a short period, allowing farmers to focus on other farm activities.

Weakness: The purchase of a chaff cutter can be expensive, especially for small-scale farmers with limited budgets. Chaff cutters require regular maintenance, such as blade sharpening and lubrication, to keep them in optimal working condition. If motorized, chaff cutters consume electricity or fuel, adding to operational costs, particularly in areas with limited access to energy. Operators may need training to use the machine effectively and safely, which can be a barrier for some farmers. Though modern machines come with safety features, improper handling or lack of attention can still lead to accidents. Depending on the size, a chaff cutter can require significant storage and operational space, which might be an issue for farmers with limited space.

Analysis: While motorized options improve efficiency, their cost and maintenance requirements can be prohibitive for low-income farmers.

Recommendation: CGA/Fert can explore subsidy or leasing models and encourage the adoption of hand-driven versions, which are affordable and adequate for smaller herds.

TOOLS/EQUIPMENT FOR PREPARING AND SPREADING MANURE/COMPOST

I. Pitchfork, shovels and wreck

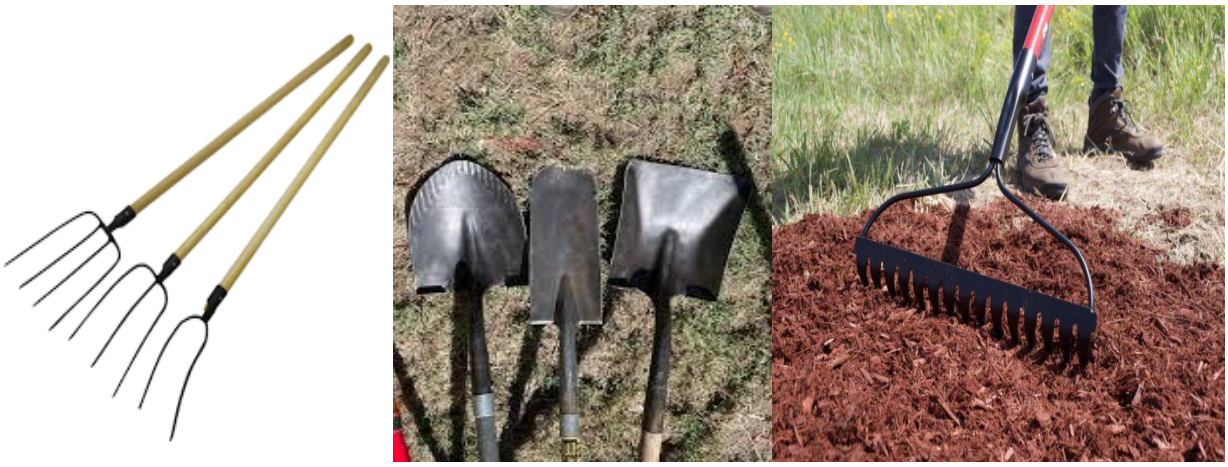


Figure 16: Pitchforks, Shovels and Wreck

These tools are easily available and accessible to farmers as they are present in almost all local *Jua Kali* artisan shops.

II. Compost aerator/mixer

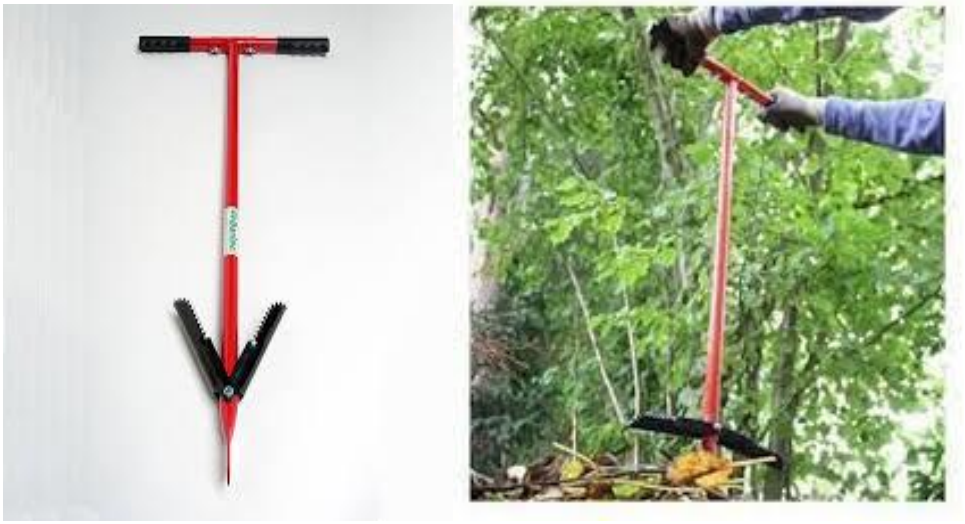


Figure 17: Compost Aerator

Description

A compost aerator is a tool designed to improve the decomposition process in compost by increasing the oxygen supply. It typically has a long handle with a turning mechanism or tines at the end. When inserted into the compost pile, the tool helps stir or turn the materials, which promotes aeration. This prevents the pile from becoming compacted and anaerobic, thus speeding up the composting process and reducing foul odours. Compost aerators come in various designs, including corkscrew-like, winged,

or clawed ends to efficiently mix organic matter. This tool has been identified from existing literature. Several fabricators visited by the consultant have shown interest in trying to fabricate this tool locally.

III. Manure spreader

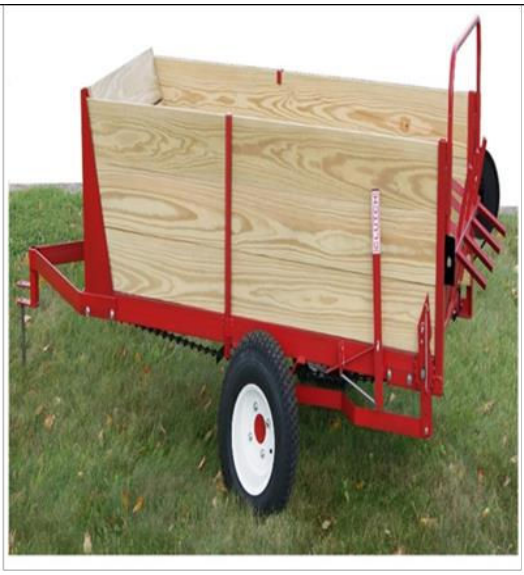


Figure 19: Animal or tractor-driven manure spreader can easily be fabricated at any Jua Kali Workshop with an estimated price of Ksh. 15,000

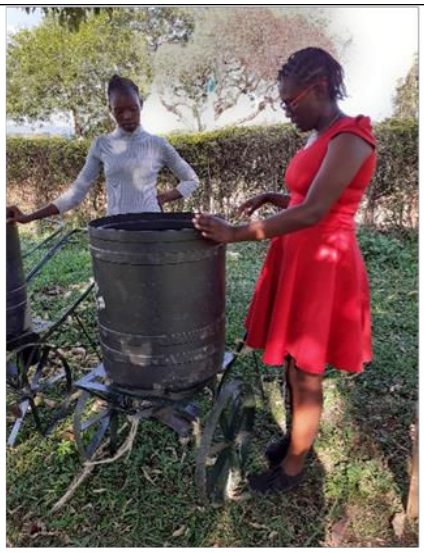


Figure 20: Improvised manure spreader from plastic containers, Source: KALRO ALUPE

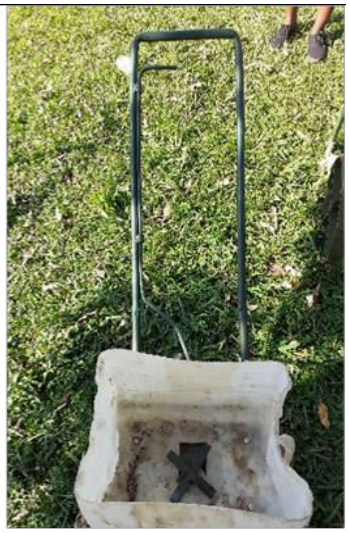


Figure 21: Improvised manure spreader from plastic containers easily available in the household, Source: KALRO ALUPE

Description

A manure spreader is an agricultural machine that distributes manure evenly across fields as a natural fertilizer. It typically consists of a large hopper that holds the manure and a mechanism that spreads it, such as spinning disks and paddles. The machine can be towed behind a tractor or as a self-propelled unit. As it moves, the spreader scatters the manure over the soil, providing nutrients to crops and enhancing soil fertility. Manure spreaders are designed to handle both solid and semi-solid manure types, helping farmers manage waste and improve soil health efficiently. There is room for locally fabricating this tool in Kenya with some fabricators suggesting animal traction instead of mini tractors that are expensive.

OTHER TOOLS/EQUIPMENT SUGGESTED BY FARMERS TO UPSCALE ORGANIC INPUT PRODUCTION

Storage Tanks

Most farmers reported the need for storage tanks with more than 500 litres capacity for the preparation and storage of Tithonia Tea, especially for FAs/ AECs intending to sell the organic input to other farmers or those attached to farmer groups that prepare the product communally and share amongst each other.

COMPARATIVE ANALYSIS AND RECOMMENDATIONS

- The jab planter, animal-driven ripper, and direct planter are critical for smallholder CA in Kenya's diverse agroecological zones. Their use can reduce soil erosion and increase resilience to unpredictable rainfall. Prioritizing training programs on CA tools, focusing on adapting them to the counties varied soil types and teaching minimal tillage techniques for optimal yields.
- Locally fabricated tools like compost aerators and animal-driven tools offer lower-cost solutions for small-scale farmers. To make costlier items (e.g., two-wheel tractors) feasible, support cooperatives or subsidized financing models, particularly through partnerships with county governments or agricultural NGOs.
- Promote locally fabricated tools and implement cooperative lending programs for higher-cost tools, ensuring equitable access for all smallholders. Tools like manure spreaders, jab planters, and compost aerators can be produced locally at a lower cost, benefiting smallholder farmers.
- Organize field demonstrations and training for tools with higher skill requirements, such as two-wheel tractors and jab planters, to help farmers quickly adapt to new practices.
- Consider the labor needs and ergonomic design for tools to ensure they are accessible to women farmers, who play a significant role in agriculture. Offer targeted training and ergonomic adaptations to increase usability, especially for women and youth.
- Facilitate collaboration between Jua Kali artisans and agriculture stakeholders to improve local tool production and reduce reliance on imports.